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MEMORANDUM

DATE:	October 24, 2016	**Docket No.**	CERCLA-08-2016-0001
TO:	Sara Sparks, Remedial Project Officer, US Environmental Protection Agency (EPA) Keith Large, Montana Department of Environmental Quality (DEQ)		
FROM:	David Tooke, Project Coordinator Adam Johnson, Hydrogeologist Chris Cerquone, Principal in Charge		
SUBJECT:	Addendum No. 3 (Version 2) to the Remedial Investigation Work Plan 2016 Deep Groundwater Sampling Frenchtown Mill Site, Missoula County, Montana		

The U.S. Environmental Protection Agency (EPA) and the Montana Department of Environmental Quality (DEQ) requested that the potentially responsible parties (PRPs) for the Former Frenchtown Mill (hereafter referred to as the "Site") evaluate existing hydrogeologic information and develop an approach to investigate the deep unconsolidated aquifer underlying the Site. This memorandum describes Addendum No. 3 to the Remedial Investigation Work Plan (RIWP; NewFields 2015a), dated November 2015, for the Frenchtown Mill Site. This Addendum outlines a current understanding of the hydrogeologic conceptual model, proposes installation of two deep groundwater wells on the site, and proposes completion of a groundwater sampling event in the fall of 2016 to address potential data gaps. The purposes of the deep groundwater investigation are to provide additional information about the degree of hydraulic communication between the shallow and deep aquifers and to evaluate whether contamination has impacted the deep aquifer.

Figures are included as **Attachment A** and Tables are included as **Attachment B** of this memo. Version 2 of Addendum No. 3 was prepared in general accordance with Section 46 of the Administrative Settlement Agreement and Order on Consent for Remedial Investigation/Feasibility Study (AOC) between the potentially responsible parties (PRPs; WestRock CP, LLC, International Paper Company, M2Green Redevelopment LLC) and the EPA, filed November 12, 2015.

BACKGROUND

Available literature was compiled and existing shallow and deep wells on or near the Site were identified to evaluate the hydrogeologic conceptual model for the Site (**Figure 1**). Literature was reviewed that describes the horizontal and vertical groundwater flow patterns in shallow and deep groundwater systems underlying the Site, groundwater interactions with the Clark Fork River, and available water quality data collected from deep wells on or near the Site. Results of the literature review were used to evaluate potential data gaps with respect to the deep groundwater system and to help select locations for proposed deep onsite monitoring wells.

HYDROGEOLOGIC CONCEPTUAL MODEL

Previous studies completed at or near the Site have consistently divided unconsolidated Quaternary-age sediments into three hydrostratigraphic units as shown on **Figure 2** (Grimestad, 1992; Smith, 1992; Hydrometrics and Inskeep, 2004). A hydrostratigraphic unit is a body of rock or aquifer material that forms a distinct unit with respect to groundwater flow (Maxey 1964). The units at the Site have been described as follows:

Unit 1: A shallow water-bearing zone that extends to a depth of approximately 50 feet below ground surface (bgs). This unconfined unit is where the majority of the existing on-site monitoring wells are screened. The sediments in this unit are sands and gravels. The hydraulic conductivity of Unit 1 ranges from approximately 150 to 1,400 feet per day (Grimestad, 1977; Grimestad 1992).

Unit 2: A leaky confining unit containing significant proportions of silt and clay from 50 feet bgs to approximately 100-150 feet bgs. Hydraulic conductivity estimates indicate that the permeability of Unit 2 at the Site is significantly lower than Units 1 and 3 (Grimestad, 1988). The hydraulic conductivity of Unit 2 is approximately 20 feet per day, and the vertical hydraulic conductivity is estimated to be less than 1.0 feet per day (Grimestad 1992). Analysis of pumping test data shows that Unit 2 behaves as a semi-confining unit and partial aquitard.

Unit 3: This deeper, semi-confined prolific water-bearing zone serves as the source of groundwater for the Site's existing onsite production wells (Fairbanks Well Field near the southern property boundary), the former onsite production wells (Mill Well Field), and private domestic wells (located north of the Site's northern boundary). The thickness of this aquifer is approximately 25 feet in areas where borehole lithologic logs are available (Grimestad, 1977), and its depth is generally between 100 and 200 feet bgs. The hydraulic conductivity of Unit 3 ranges from approximately 1,000 to 2,100 feet per day (Grimestad 1988; Smith 1992).

The hydrostratigraphy described above is likely a simplification of actual subsurface conditions at the site. Complexities may include discontinuities and changing thicknesses in the above units as well as interbedded sediments with variable textures. These homogeneities could alter permeability values locally, creating non-uniform hydraulic connectivity within the three units.

Beneath Unit 3 are two reported hydrostratigraphic units: The Eocene-to Miocene-age ancestral Clark Fork River (CFR) sediments which exhibit low permeability (Grimestead 1988, Lewis 1998), and the Proterozoic- to Paleozoic-age bedrock basement, which also has a low permeability (Smith, 2006b).

A hydrogeologic conceptual model developed for the portion of the Site between the industrial area and the CFR using the information presented above is provided on **Figure 2**. Water table maps constructed for the shallow aquifer (Unit 1) for periods from 2012 to 2015 indicate that groundwater flows toward the CFR, and that flow paths generally contain components of both downstream (longitudinal) and transverse (riverward) movement. **Figure 1** includes water table contours constructed from data collected in December 2015 (NewFields 2016). The general flow direction is to the west/northwest. Approximately 25 groundwater elevation measurements collected in May and November 1988 from wells in the northwestern portion of the Missoula Valley were used to create potentiometric surface maps for Unit 3 (Smith 1992). When mapped on a regional basis, groundwater flow directions and horizontal gradients in the deeper aquifer (Unit 3) resemble those of Unit 1 (**Figure 1**). Available information about vertical hydraulic gradients of the three hydrogeological units and the degree of inter-aquifer hydraulic communication on the Site is inconclusive. However, due to the impermeable nature of the sediments underlying Unit 3, groundwater from the Site in Units 1, 2, and 3 is thought to discharge to the CFR along or slightly downstream of the Site.

EXISTING WATER SUPPLY WELLS ON AND NEAR THE MILL SITE

Lotic LLC (2012) provided a description of the water rights associated with the property that are or were used for industrial operations, production support, and agricultural/domestic purposes. The information reviewed from Lotic LLC (2012) is summarized in **Table 1**. NewFields completed a site reconnaissance in July 2016 to field-verify the existence and locations of selected wells listed in **Table 1**. The following summarizes the current status of these wells. Available recorded locations are shown on **Figure 1**. Recorded well depths, locations, and estimated static water levels of verified wells are summarized in **Table 2**. Available records suggest that the water supply wells in the Fairbanks Well Field and the Mill Well Field were completed in Unit 3. Some Production Support wells and some Agricultural/Domestic wells may also be completed in Unit 3, but well logs have not been acquired for all these wells and current data suggest some of these wells were completed in Unit 1 (see **Table 2**).

- Five industrial water supply wells are recorded for the Mill Well Field, although only two of those wells (Deep Well #4 and Deep Well #5) were active and useable as of July 2012 (Lotic 2012). NewFields has verified the presence of wells #4 and #5, but has not been able to locate Deep Wells #1, #2, or #3.
- Six production support wells have been verified to exist within the former industrial area of the Site. These include: the Wastewater Clarifier well, the Cartage Building well, the Waste Fuel Boiler well, the Hoffman Construction well, the Car Wash well, and the Log Chipper well.
- Nine production wells (Deep Wells #11, 12, 13, 14, 15, 16, 17, 20, 21) are located at the Fairbanks Well Field, all of which have been field-verified by NewFields. The installation of these wells reportedly began in the 1960s (MBMG 2016). These wells provided the primary supply of water to the mill from the 1970s to 2010 and are still viable.
- Seven agricultural/domestic wells were reported by Lotic LLC (2012) on or near the Site. NewFields was able to field-verify the Timber Products well, the original and new Peterson Farm wells, and the Fairbanks Ranch well. The Fairbanks Ranch well is located outside the facility property boundary. NewFields has not field-verified the Peterson Feedlot well. NewFields also could not locate groundwater supply wells associated with the Curtis Ranch or the O’Conner house locations.

NewFields is not aware of any long-term historical groundwater level data for wells completed in Unit 3. The only water quality data available for Unit 3 wells are associated with offsite domestic wells located north of the northern site boundary (EPA-Start 2012).

Horizontal Patterns of Shallow and Deep Groundwater Flow

Water table maps constructed for the shallow aquifer (Unit 1) between 2013 and 2015 after operations at the facility ceased in 2010 (NewFields 2015a) indicate that the groundwater flow direction in Unit 1 is toward the CFR, and that flow paths generally include components of both longitudinal (down valley) and transverse (toward the river) movement. The general flow direction varies from west to northwest, with some temporal and spatial variations observable. Groundwater elevations during this three-year period indicate that, in general, horizontal gradients increase from east to west and from south to north. **Figure 1** (**Attachment A**) includes water table contours constructed from data collected in December 2015 (post-operational phase of the facility).

Site-specific water table maps for Unit 1 constructed for the period from 2001 to 2003 when the facility was operational (Hydrometrics and Inskeep 2004) also show a general northwesterly groundwater flow direction in the shallow aquifer. Two maps from this period indicate that, in the vicinity of the former industrial plant, Unit 1 groundwater flowed to the east, away from the river. Since the facility was operational during this period, it is plausible that water infiltrating through the bottom of the aeration basins and treated water holding ponds west of the industrial area may have created a temporary localized groundwater mound. Water table contours constructed from groundwater elevation data between 2012 and 2015 after the Mill closed do not show groundwater mounding in this area. Since Mill closure, the dominant groundwater flow direction has been to the west-northwest.

Smith (1992) constructed potentiometric maps for Unit 3. These are shown on **Figure 1**, and indicate a flow direction on the Site to the west/northwest (in May 1988) and to the west (November 1988). These interpretations indicate that the groundwater flow directions observed in Unit 1 (NewFields 2016) and Unit 3 (Smith 1992) are generally similar. **Figure 1** includes potentiometric surface maps for May and November 1988 presented by Smith (1992) as well as a water table map constructed from data collected in December 2015 (NewFields 2016).

Vertical Patterns of Shallow and Deep Groundwater Flow

LaFave (2006) indicates that artesian conditions in Unit 3 wells were documented both up- and down-gradient of the Site (within 1-2 miles of the exterior boundaries of the property). These conditions were defined based on the fact that "deep" wells (greater than 80 feet bgs) were flowing at ground surface or that measured water levels were within 10 feet of ground surface. According to Grimestad (1992), upward vertical flows upgradient (south) of the Site are caused by increasingly confined conditions in

Unit 3 and a localized area of near-surface bedrock. Grimestad (1988) interpreted these artesian conditions as indicative of the hydraulic isolation of Units 1 and 3. This finding by Grimestad appears to be consistent with a semi-confining layer (Unit 2) overlying Unit 3 that creates a partial barrier to flow between the two aquifers (Units 1 and 3), and that groundwater in Unit 3 may be under pressure.

Investigations in the 1980s provided additional information for evaluation of vertical gradients and inter-aquifer hydraulic communication. In one study, water levels in an Operable Unit 1 shallow observation well (Unit 1) near the Fairbanks Well Field in the southern portion of the Site responded to pumping of onsite production wells in Operable Unit 1 (hydrostratigraphic Unit 3). This suggests that water in Unit 1 may have leaked through parts of the Unit 2 semi-confining layer (Grimestad, 1988) and into Unit 3 in the vicinity of the Fairbanks Well Field at a time when up to 25 million gallons of water were pumped from the deep wells in Unit 3. It should be noted that this well field is a significant distance south of the industrial area and wastewater treatment ponds. Pumping of the deep wells during Mill operation may have created a downward hydraulic gradient near the production well field which likely resulted from lowered heads in the production aquifer (Unit 3) created by pumping cones of depression.

Aquifer-River Interaction

A major river system may serve as a groundwater divide in some reaches, while at other locations the recharge-discharge relationships between a river channel and nearby aquifers may be more complex. Available data reveal variable aquifer interactions with the CFR in the Missoula Valley. For example, the CFR recharges Unit 1 and Unit 3 upstream of the Site (at downtown Missoula). In the general vicinity of the Site, Units 1 and 3 discharge to the CFR (**Figure 1**). Bedrock present west and south of the property lies relatively close to the CFR channel (Smith 2006a), which suggests that a large proportion of shallow and deep groundwater discharges to the river in this reach along the Site or slightly downgradient of the Site. Due to the relatively low permeability of Unit 2 and its position above Unit 3 but below Unit 1 and the CFR, the groundwater flux to the CFR from hydrostratigraphic units 2 and 3 may differ from than that of Unit 1. Little information is available about recharge-discharge relationships between the river and the aquifer north and west of the Site.

Groundwater Quality

The following is a summary of available historical information concerning the water quality of Unit 3 groundwater at the Site. Information is fairly scarce concerning groundwater quality in Unit 3, and statements in early documents conflict with statements made in subsequent documents, complicating any conclusions.

An environmental impact statement completed in 1974, (MDHES 1974) offered conflicting statements about water quality of Unit 3 groundwater. This EIS states that although no wastewater treatment effluent impacts have been observed in deep wells peripheral to (or downstream of) the facility property, "movement of dissolved chemicals from waste ponds into plant production wells tapping the deep aquifer [Unit 3] has been detected" (pgs. 30-31). The 1974 study does not include data compilations to support these statements.

In an early site-specific study, Grimestad (1977) provided the following conclusions:

- “Migration of waste effluent from the rapid-infiltration system to the deep aquifer is theoretically possible but no contamination attributable to this system has been detected” (pg. 64-65).
- “No contamination attributable to the rapid-infiltration system has been detected in the deep domestic aquifer” (pg. 100).
- Piezometric and specific conductance (conductivity) data do not indicate any “massive” flows of effluent into the deep aquifer (pg. 99).

The document indicated that elevated chloride concentrations had been detected in a deep onsite well north of the industrial area (R. Peterson Well No. 1). However, chloride data were not provided in the study, nor were data for deep wells upgradient of the Peterson on-site well. The Peterson Ranch also reportedly was used as a Dairy Farm at that time, which may have been the source of chloride in the groundwater. Conductivity values ranged from 700 to 900 μs/cm in samples reportedly collected in the 1970s from Peterson Well No. 1.

An EIS completed in 1985 (MDHES 1985) concluded the following: “The deeper aquifer [downgradient of the site] has not shown any contamination, according to Champion and DHES deep well sampling….In summary, studies have shown that groundwater pollution from Champion’s effluent appears to be confined to the upper or shallow aquifer [Unit 1]…”

Hydrometrics and Inskeep (2004) concluded that the quality of Unit 3 groundwater was high in domestic wells completed along the northern boundary of the Site, and there was no indication that groundwater from the shallow alluvial aquifer (Unit 1) had migrated to the deeper aquifer (Unit 3).

A groundwater sample collected by the EPA from a production well (Deep Well #11) on the south end of the Site and 5 samples collected from Unit 3 domestic wells immediately north of the Site did not contain any contaminants of potential concern (arsenic, manganese, and dioxins) (EPA-START 2012). However, groundwater flow determinations suggest that domestic wells north of the property may be recharged by groundwater coming from the east (Smith 1992), rather than from the south, where contaminants could originate from the Site. Also, Deep Well #11 is on the south end of the Site, upgradient from potential source areas (i.e.: primary treatment areas of the wastewater treatment system). Locations of these wells are shown on **Figure 1**.

The thickness and partial confining characteristics of Unit 2 inhibit Unit 1 groundwater from migrating to Unit 3 of the aquifer. Studies completed by EPA (2012) and NewFields (2014 and 2015) demonstrate that the Contaminants of Potential Concern (COPCs) present in Unit 1 groundwater are limited in areal extent, and are associated with metals (arsenic and manganese) and general water quality parameters (TDS and sulfate). Results of these studies suggest that migration of constituents at concentrations of concern is limited because of a combination of dilution and attenuation; the latter may be related to changes in redox conditions along the migration pathway. The cessation of pumping of groundwater from Unit 3 associated with operation of the Mill has also reduced the potential for any migration from Unit 1 to Unit 3. If COPCs from Unit 1 groundwater were migrating to Unit 3, the concentrations in Unit 3 would likely be non-detectable due to attenuation in Unit 2 and dilution within Unit 3 groundwater.

SCOPE OF WORK

The hydrogeologic conceptual model suggests that the probability of groundwater quality concerns in Unit 3 of the aquifer is low. Nevertheless, limited water quality data from Unit 3 are available. For this reason, two deep monitoring wells are proposed downgradient of the former Mill's primary wastewater treatment and primary sludge pond storage areas to provide water quality data at a location where Unit 3 would most likely be impacted based on source areas at the Site. The objectives of deep groundwater wells and a sampling event are to evaluate groundwater flow patterns in the deep aquifer; evaluate the presence or absence of COPCs in Unit 3 groundwater, and improve the Site hydrogeologic conceptual model regarding interaction between Unit 1 and Unit 3 groundwater systems.

The activities proposed as part of this addendum include the following:

1. Installing two new monitoring wells in Unit 3 downgradient of wastewater treatment ponds at 1) a location adjacent to existing Unit 1 monitoring well SMW-16 and 2) a location adjacent to existing Unit 1 monitoring well SMW-17 (**Figure 3**).
2. Surveying the ground elevations and top-of-casing elevations of the new monitoring wells and selected existing water supply wells (**Table 2**).
3. Completing a groundwater monitoring event in which water quality samples and groundwater elevations will be collected at the new wells, at existing wells SMW-16 and SMW-17, and at an existing upgradient water supply well completed in Unit 3 (Deep Well #4). These wells will be sampled for the constituents shown in **Table 3** and discussed below.
4. Recording groundwater elevations at shallow and deep monitoring wells on the Site to evaluate horizontal and vertical hydraulic gradients. The wells to be monitored are shown in **Table 2**.
5. Completing a summary report documenting the findings of this investigation.

<u>Scope Justification</u>

A new monitoring well (NFMW22D) to be completed in Unit 3 at the location of existing shallow well SMW-16 will be located directly downgradient of potential contaminant source areas as shown in **Figure 3**. A second new monitoring well (NFMW23D) will be drilled and installed at the location of existing shallow well SMW-17. Previous investigations (EPA 2012, NewFields 2014) have identified primary settling ponds and basins used to store solid wastes in the former wastewater treatment system as potential sources of contaminants to shallow groundwater. If contaminants have migrated to Unit 3 groundwater, deep and shallow groundwater flow directions suggest that wells at these locations are most likely to confirm their presence (Smith (1992), NewFields 2015, 2014) (**Figure 1** and **Figure 3**). Based on currently available information regarding groundwater flow patterns and inter-aquifer hydraulic communication on the Site, locations downgradient of Solid Waste Basin 6 and Treated Wastewater Storage Pond HP9 would be the most likely to intercept COPCs that could have migrated through Unit 2 into the Unit 3 aquifer. If impacts attributable to former onsite operations are not detectable at these locations it is unlikely that COPCs are present in Unit 3 at other locations on the Site.

Installation of Unit 3 deep wells (NFMW22D and NFMW23D) coincident with existing Unit 1 monitoring wells (SMW-16 and SMW-17, respectively) will facilitate the evaluation of vertical hydraulic gradients downgradient of potential source areas. The proposed sampling of a Unit 3 deep well upgradient of former industrial activities will allow for evaluation of background COPC concentrations. Deep Well #4 was selected as an upgradient Unit 3 (background) sample location because the total depth has been confirmed, the well is accessible for sampling, and it is present on the eastern boundary of the site in a central location that is roughly upgradient along a flow path toward the proposed deep monitoring wells (NFMW22D and NFMW23D).

Groundwater samples will be analyzed for field parameters, metals, nutrients and common ions, as these analyte groups include constituents detected in Unit 1 groundwater and that have the potential to migrate through Unit 2 to deeper groundwater. Concentrations of constituents from these analyte groups provide a signature for individual groundwater samples which can be compared to upgradient sample locations to help determine the source of the groundwater. Also, measurements of these constituents have been documented for several Unit 1 monitoring wells before and after closure of the mill. Samples will also be analyzed for dioxins/furans, polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) as discussed further below.

The tasks below were designed to meet the objectives of the project, and include a detailed discussion of proposed methods to complete the scope of work for this Addendum.

Task 1: Monitoring Well Drilling, Installation, and Development

NewFields will subcontract with a drilling firm experienced with the installation of deep monitoring wells. Based on our understanding of hydrogeologic conditions described above and a review of local well logs, we anticipate that the final borehole and monitoring well depths will be between 150 and 200 feet bgs. The exact drilling locations will be determined in the field and will depend on terrain conditions and accessibility. The wells will likely be completed using air rotary techniques due to the estimated total borehole and monitoring well depth. Although drilling using air rotary techniques precludes the possibility of collecting intact material samples, NewFields will work with the drilling contractor to select equipment that will facilitate the collection and description of drill cuttings during logging of the lithologic units encountered.

NewFields staff will provide oversight of the drilling contractor. A hydrogeologist familiar with the Site and with local geologic conditions will provide field services during the drilling, installation, and development of the deep monitoring wells. Field staff will collect samples of drill cuttings and record descriptions of drilling conditions and lithologic materials encountered during the process. Descriptions will be recorded at least every ten feet or at every significant change in lithology, whichever is more frequent. The hydrogeologist will document water-bearing intervals encountered and will estimate groundwater yields to the extent possible. Following the completion of borehole drilling, NewFields will prepare detailed lithologic logs. All downhole equipment will be properly decontaminated prior to use in the borehole.

The monitoring wells will be constructed using 4-inch diameter PVC casing with flush-threaded connections. This material is appropriate for deeper monitoring wells, has high tensile strength, and flush-mount connections will help ensure a continuous seal. Based on hydrogeologic conditions encountered during the drilling of the borings, NewFields (in consultation with the agencies and PRPs) will determine final well design specifications, including total depth, length and placement of screened interval and well stabilizers, and depth intervals of sand pack and sealing material. The screen slot size may be selected in advance, or it may be determined based on materials encountered in Unit 3.

A silica-sand filter pack of appropriate size will be placed surrounding each casing from the bottom of the PVC to approximately 3 feet above the top of the screened interval. A standard bottom cap will be employed. A five-foot interval of coated bentonite pellets will be placed above the filter pack. A cement-bentonite grout will be emplaced above the coated pellets to a depth 5 feet above the field-documented elevation of the potentiometric surface. Bentonite chips will be placed above the cement-bentonite grout to the ground surface. The bentonite and grout intervals will ensure hydraulic separation between Units 1, 2, and 3, and will prevent the infiltration of surface runoff into the boreholes. The wells will be protected with above-ground steel monuments and locking caps. The cement around the base of the monuments will slope slightly away from the wells. A permanent nameplate will be affixed to the outside of each casing. NewFields will provide oversight during and documentation of the monitoring well installation process to ensure that the wells are constructed according to specifications. Following monitoring well construction, NewFields will prepare comprehensive well completion diagrams to complement the lithologic logs.

Following well installation, NewFields will direct well development to ensure that fine sediments are removed from each well and filter pack. Well development is a critical step in achieving acceptable hydraulic communication between each monitoring well casing and the surrounding aquifer. Well development techniques will include pumping, surging, and/or other methods determined through consultations with the drilling contractor. Development will proceed until water quality parameter monitoring data (including turbidity) suggest that little or no additional improvement can be achieved. Development will be performed at least one week prior to water quality sampling.

NewFields standard operating procedures (SOPs) applicable to this task will include: field documentation; equipment decontamination; groundwater level and field parameter measurements; and monitoring well construction and well development, all of which have been previously provided in the RIWP (NewFields, 2015a).

Task 2: Monitoring Well Survey

A Montana-licensed surveyor will determine the horizontal position, the elevation of the top of the PVC casing, and the ground surface elevation at new monitoring wells NFMW22D and NFMW23D as well as at selected water supply wells identified in **Table 2**. Unit 1 monitoring well locations and elevations have been determined as part of the 2015 Remedial Investigation (NewFields, 2016). Surveyed elevations for both aquifers will facilitate the evaluation of horizontal and vertical patterns of groundwater flow at the Site.

Task 3: Water Quality Sampling

Five wells (NFMW22D, NFMW23D, SMW16, SMW17, and Deep Well #4) will be sampled for the analyte groups identified in **Table 3**. These include field parameters, metals, common ions, nutrients, dioxins/furans, PCBs, VOCs, and SVOCs. Samples for dioxins/furans will be analyzed by Frontier Laboratories in El Dorado Hills, California. All other samples will be analyzed by Pace Analytical Laboratories in Minneapolis, Minnesota. Individual analytes comprising each analyte group are defined in **Table 3** (Attachment B) and Table D-5 of the approved FSP (NewFields 2015b). Wells will be sampled in accordance with procedures outlined in Sections 2.7.3.2 and 2.8 of the FSP (Appendix D of the RIWP; NewFields 2015b).

Please note that the analytes listed above will be collected during the proposed Unit 3 monitoring event per agency request. However, the PRPs believe that sampling and analysis of organic pollutants such as dioxins/furans, PCBs, VOCs, and SVOCs and is unnecessary for determining the presence/absence of impacts to Unit 3 groundwater. Samples should not be analyzed for VOCs, SVOCs or PCBs because these constituents have not been detected above laboratory reporting limits and/or above relevant screening levels and standards in previous investigations of Unit 1 groundwater (EPA-START, 2012; NewFields, 2014, 2016a, 2016b). Groundwater samples also should not be analyzed for dioxins/furans because they were not detected in Unit 1 groundwater above EPA water quality standards and because dioxins generally do not partition to a dissolved phase in groundwater. Dioxins have a high affinity to bind to soils (particularly organic material) and remain in the suspended solid fraction (EPA, 2010; Persson, Shchukarev, Oberg, & Tysklind, 2008; Sormunen, Koistinen, Leppanen, & Kukkonen, 2008). EPA (2010) concludes: "If released to soil, TCDD is not expected to leach". In addition, if dioxins were present in Unit 1 groundwater, it is highly unlikely that they would migrate through the poorly conductive Unit 2 to Unit 3 groundwater. The most important constituents for this investigation are metals, common ions, and field parameters. In previous investigations, two metals (As and Mn) have been observed in Unit 1 groundwater. Due to their mobility in groundwater, these metals could be used as surrogates to investigate the presence or absence of impacts to Unit 3 groundwater. Additionally, common ions (e.g. sodium) and field parameters provide chemical water signatures which have been associated with background groundwater sources and Unit 1 groundwater that has been altered by former waste water operations. These chemical groundwater signatures can be used to determine the presence or absence of impacts to Unit 3 groundwater.

Task 4: Groundwater Monitoring - Units 1 and 3

Water level measurements are proposed in 10 Unit 1 wells, 13 water supply wells, and two new Unit 3 wells as identified in **Table 2** and shown on **Figure 3**. This information will facilitate the evaluation of horizontal and vertical hydraulic gradients, allow for refinement of the Site conceptual model, and provide data for updating water table and potentiometric surface maps. Water level measurements will be completed in accordance with procedures outlined in Sections 2.7.3.2 and 2.8 of the FSP (Appendix D of the RIWP; NewFields 2015b). Well logs, as available, will be obtained for the 13 water supply wells to help determine subsurface geology and well specifications. If logs are not available for specific wells, or if logs cannot be definitively correlated with certain wells, total depths will be determined with a graduated electronic water level probe during the monitoring of groundwater elevations. Associated hydrostratigraphic units will be determined using any available information from nearby wells or boring logs, along with the total depth of the particular well and depth to water.

Task 5: Summary Report of Deep Groundwater Conditions

Analytical data will be verified and validated in accordance with the approved QAPP (Appendix E of the RIWP; NewFields 2015c). Results will be organized in a NewFields data management system (DMS) then uploaded to the SCRIBE project database in accordance with procedures outlined in the QAPP and the technical memo submitted to EPA on May 6, 2016 (NewFields 2016). A summary report will be prepared as a technical memorandum and submitted to EPA and DEQ on behalf of the PRPs. The memo will document the methods, results, and conclusions obtained during the study. Depth to water measurements and analytical data tables will be attached to the memorandum along with figures showing monitoring locations and water table and potentiometric surface maps. Field notes and sampling forms will also be included in the memo, as well as any other pertinent data collected during the deep groundwater investigation.

HEALTH AND SAFETY

Workers involved in the sampling will complete work in accordance with the approved Health & Safety Plan (Appendix F of the RIWP; NewFields 2015d). The HASP will be amended with Job Safety Analysis (JSA) worksheets to address safety concerns related to the drilling, installation and sampling of deep wells.

SCHEDULE

The schedule will depend on EPA approval of Addendum 3, weather conditions, and the availability of drilling contractor personnel and equipment. Task 1 is tentatively scheduled for November 2016. Task 1 will be completed within 1 week. Task 2 will be initiated at the conclusion of the drilling campaign, and will require approximately 1 week to complete and receive results. Tasks 3 and 4 will be conducted no sooner than one week following development of the new deep well. The final report (Task 5) will be provided to the agencies and PRPs approximately three months after the installation of the new deep wells.

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Attachments: A – Figures

Figure 1: Well Locations and Groundwater Flow Patterns
Figure 2: Hydrogeologic Conceptual Model
Figure 3: Groundwater Monitoring and Sample Locations

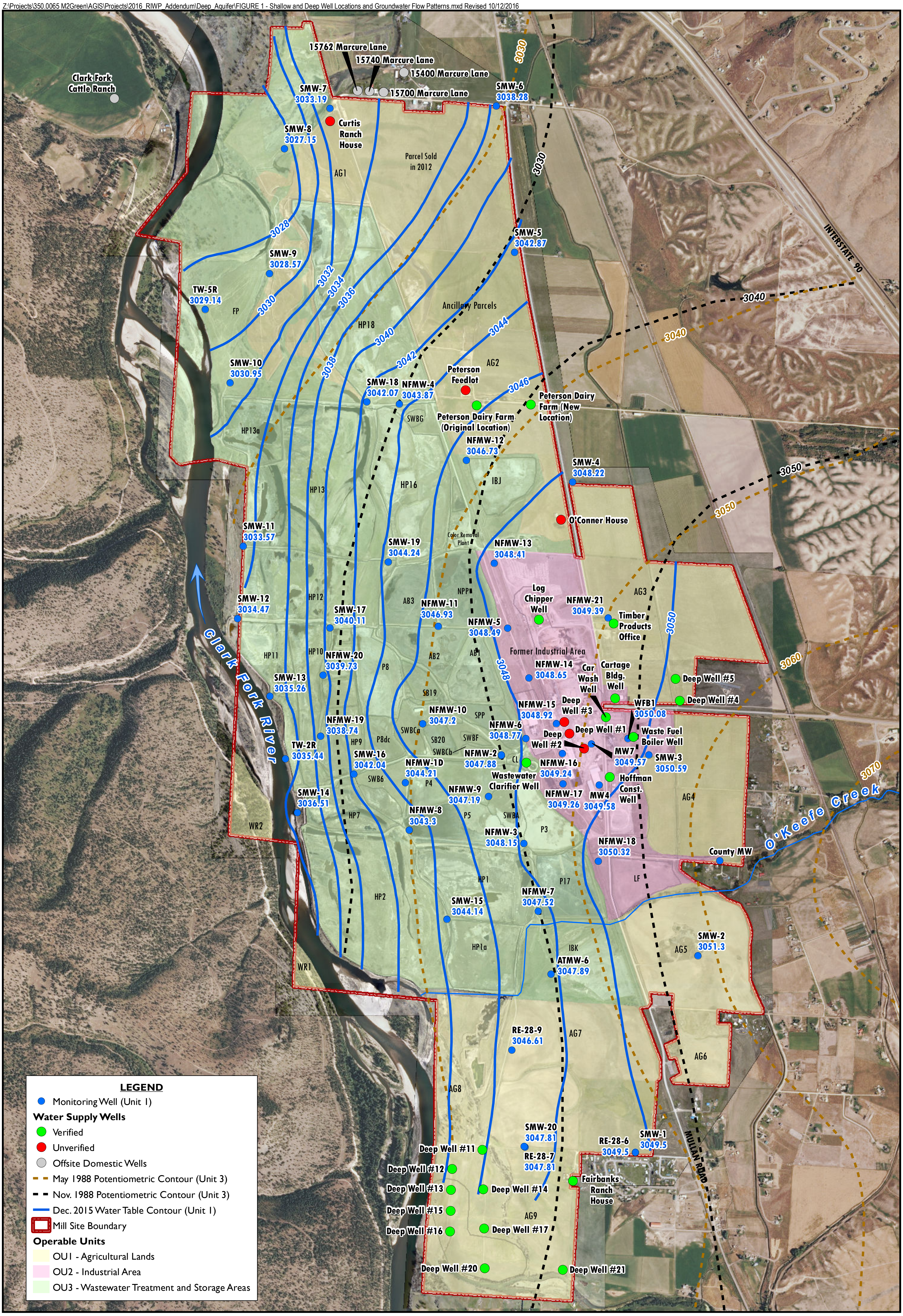
B – Tables

Table 1: On-site Water Supply Wells Associated with Water Rights (Lotic 2012)
Table 2: Summary of Well Parameters
Table 3: Groundwater Sample Methods, Containers and Preservatives

Attachment A

Figures

Z:\Projects\350.0065 M2Green\AGIS\Projects\2016_RIWP_Addendum\Deep_Aquifer\FIGURE 1 - Shallow and Deep Well Locations and Groundwater Flow Patterns.mxd Revised 10/12/2016



N

0 Feet 1,600

NewFields

Aerial Photo Source: NAIP 2011 and Newfields 2016 (Within Site Boundary)

Well Locations are based in part on Lotic (2012)

3040 - feet above mean sea level

Notes

AG - Agricultural Land
AB - Aeration Stabilization Basin
CL - Clarifier
FP - Flood Plain
HP - Holding or Storage Pond
IB - Rapid Infiltration Basin
LF - Landfarm

NPP - North Polishing Pond
P - Settling Pond
SB - Spoils Basin
SPP - South Polishing Pond
SWB - Solid Waste Basin
WR - West of River

Well Locations and Groundwater Flow Patterns
Former Frenchtown Mill Site
Missoula County, Montana
FIGURE 1

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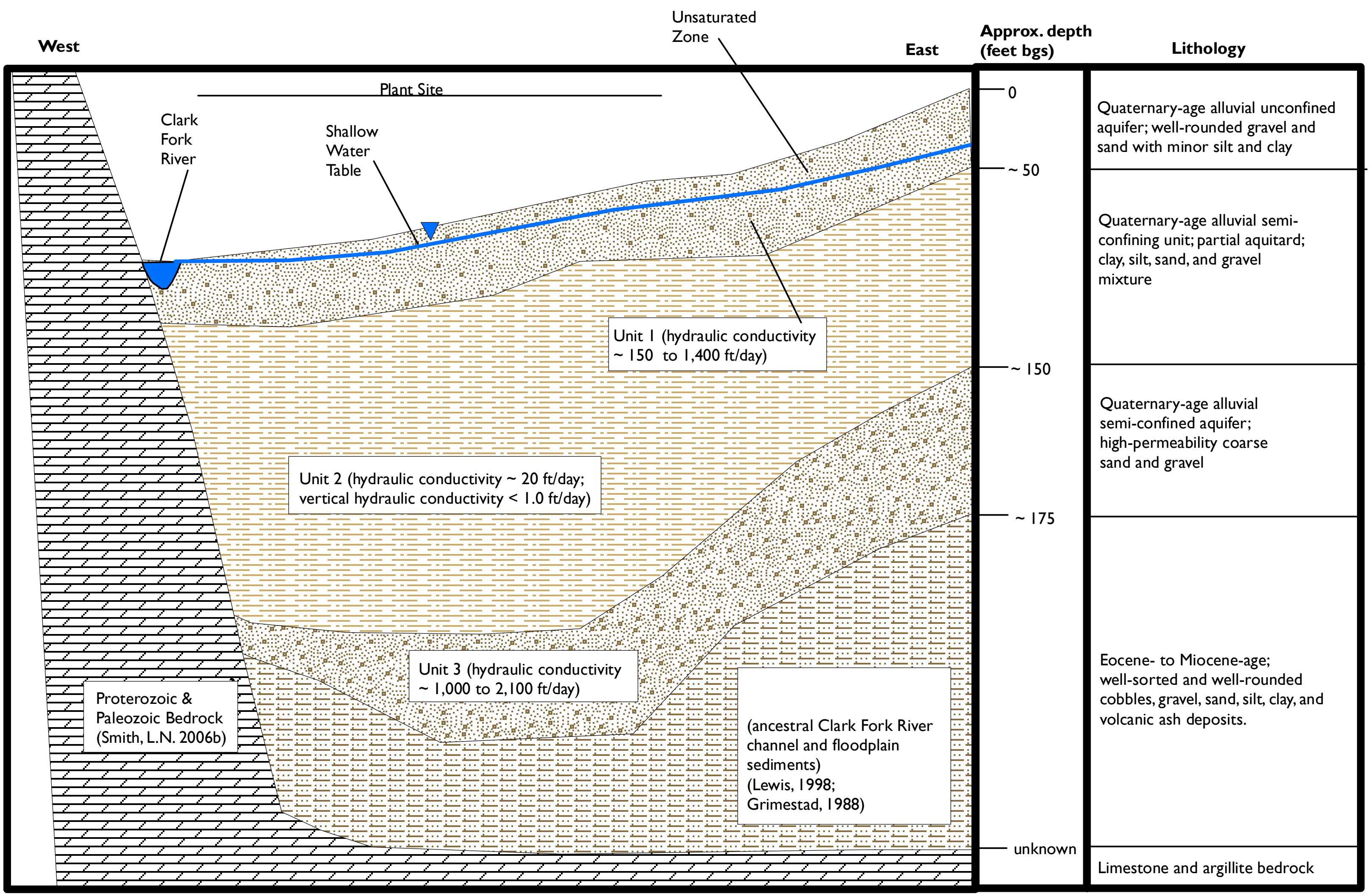


<u>Hydraulic conductivity values</u>:

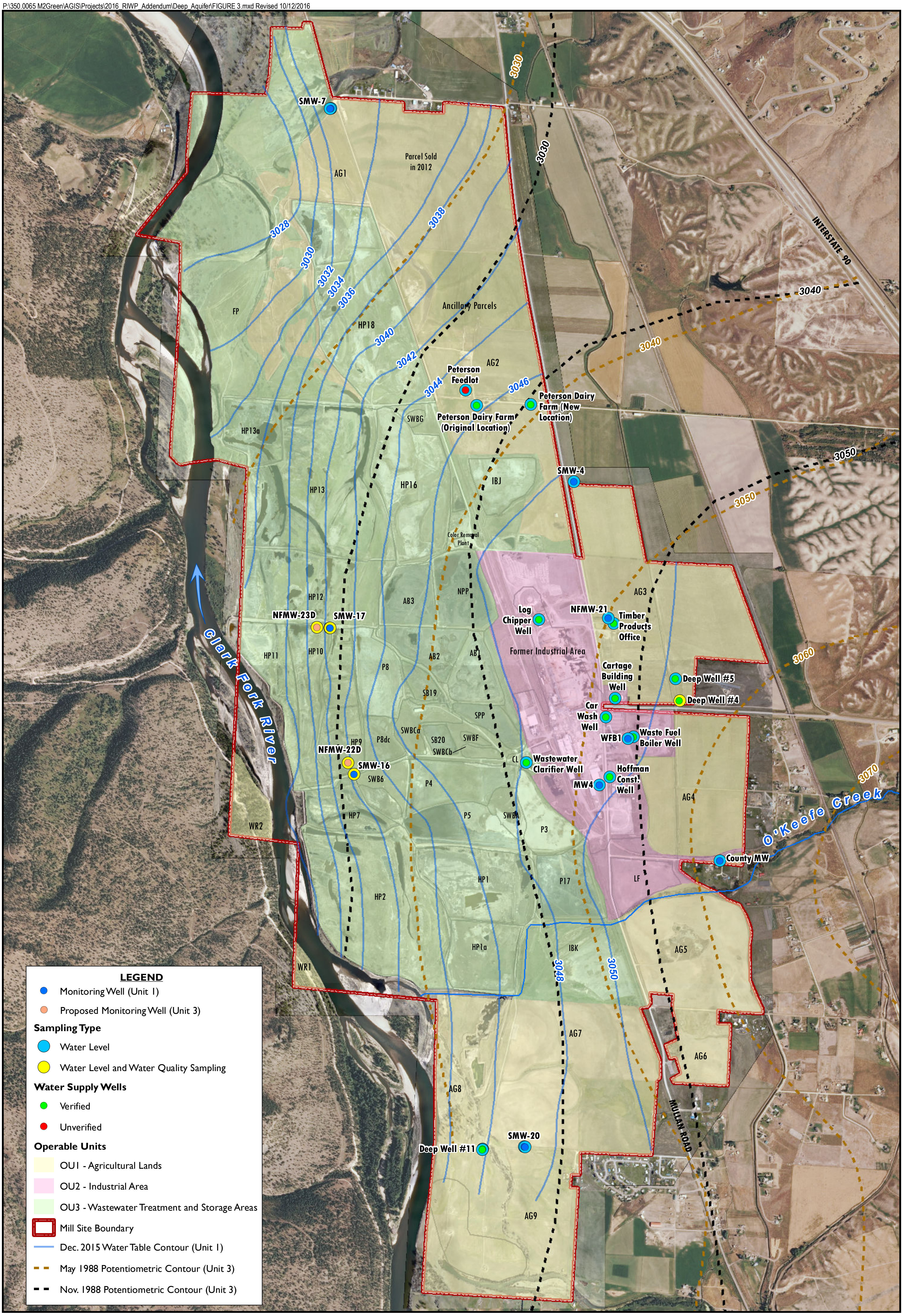
Unit 1 from Grimestad (1977; 1992)
Unit 2 from Grimestad (1992)
Unit 3 from Smith (1992) & Grimestad (1988)

Cross section represents the area from near the industrial plant site to the Clark Fork River.
Schematic is not to scale.
~ indicates approximate value.
< indicates less than the value.
bgs is below ground surface

NewFields

Hydrogeologic Conceptual Model
Former Frenchtown Mill Site
Missoula County, Montana
FIGURE 2

P:\350.0065 M2Green\AGIS\Projects\2016_RIWP_Addendum\Deep_Aquifer\FIGURE 3.mxd Revised 10/12/2016



N

0 Feet 1,600

NewFields

Aerial Photo Source: NAIP 2011 and Newfields 2016 (Within Site Boundary)

Well Locations are based in part on Lotic (2012)

3040 - feet above mean sea level

Notes

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SWB - Solid Waste Basin
WR - West of River

Groundwater Sample Locations
Former Frenchtown Mill Site
Missoula County, Montana
FIGURE 3

Attachment B

Tables

TABLE 1

On-site Water Supply Wells Associated with Water Rights (Lotic 2012)

Addendum No. 3: Deep Groundwater Sampling

Frenchtown Mill Site, Missoula County, Montana

Well Name	Status*	V **	Well Name	Status*	V **
Fairbanks Well Field			Production Support		
Deep Well #11	A	Yes	Wastewater Clarifier Well	I	Yes
Deep Well #12	A	Yes	Cartage Building Well	A	Yes
Deep Well #13	A	Yes	Waste Fuel Boiler Well	A	Yes
Deep Well #14	A	Yes	Hoffman Construction Well	I	Yes
Deep Well #15	A	Yes	Car Wash Well	I	Yes
Deep Well #16	A	Yes	Log Chipper Well	A	Yes
Deep Well #17	A	Yes			
Deep Well #20	A	Yes			
Deep Well #21	A	Yes			
Mill Well Field			Agricultural/Domestic		
Deep Well #1	I	No	Timber Products Office	A	Yes
Deep Well #2	I	No	Fairbanks Ranch House	A	Yes
Deep Well #3	I	No	Peterson Dairy Farm (original location)	A	Yes
Deep Well #4	A	Yes	Peterson Dairy Farm (new location)	A	Yes
Deep Well #5	A	Yes	Peterson Feedlot	A	No
			Curtis Ranch House	I	No
			O'Conner House	I	No

Notes:

V = Verified; A = Active; I = Inactive;

* Information from Lotic (2012); Active/Inactive designation refers to the status of the water right

** NewFields has field-verified the locations of wells denoted with a "Yes"

TABLE 2
Summary of Well Parameters
Addendum No. 3: Deep Groundwater Sampling
Frenchtown Mill Site, Missoula County, Montana

Sample Order	Sample Location and Name	OU	Year Well was Installed	Total Well Depth (feet bgs)	Estimated Depth to Water (feet BTOC)	Depth to Water December 2015 (feet BTOC)	Screened Interval (feet BTOC)		Northing	Easting	Surface Elevation ft amsl	Top of Casing Elevation ft amsl	Well Diameter (inches)	Sampling and Analysis		
							From	To						Survey	Water Level	Water Quality Sample
Unit 1 Monitoring Wells																
1	CountyMW	OU1	pre-2014	52.16	24.7	---	20.0	50.0	1022174.0	798973.6	3075.31	3075.60	4	*	x	*
2	SMW20	OU1	pre-2014	28.03	---	15.91	15.5	31.2	1017075.4	795485.0	3060.10	3063.72	4	*	x	*
4	NFMW21	OU1	2015	25.57	---	16.87	4.6	26.6	1026509.5	796989.9	3064.65	3066.26	2	*	x	*
5	SMW4	OU1	pre-2014	27.67	---	15.47	13.4	31.2	1028933.4	796368.3	3060.01	3063.69	4	*	x	*
6	SMW7	OU1	pre-2014	30.88	---	19.43	23.2	32.8	1035586.8	792036.8	3050.92	3052.62	4	*	x	*
7	WFB1	OU2	pre-2014	28.64	---	15.78	~10	28	1024347.7	797333.8	3066.27	3065.86	2	*	x	*
8	MW4	OU2	pre-2014	30.54	---	21.08	10	32	1023520.2	796824.0	3068.69	3070.66	2	*	x	*
9	SMW17	OU3	pre-2014	34.46	---	16.69	16.8	36.8	1026324.3	792017.5	3055.66	3056.80	4	*	x	x
10	SMW16	OU3	pre-2014	34.57	---	18.52	16.1	37.1	1023728.1	792437.6	3058.00	3060.56	4	*	x	x
Water Supply Wells[1]																
1	Deep Well #11	OU1	1966	---	18.0	---	---	---	1017018.4	794737.7	---	---	12	x	x	---
2	Deep Well #4	OU1	1988	193	32.0	---	150.0	174	1025027.1	798254.2	---	---	18	x	x	x
3	Deep Well #5	OU1	1987	---	18.0	---	---	---	1025414.9	798180.0	---	---	---	x	x	---
4	Peterson Dairy Farm New Loc	OU1	---	>100	16.3	---	---	---			---	---	6	x	x	---
5	Peterson Dairy Farm Orig Loc	OU1	1972	145.3	11.1	---	open bottom				---	---	6	x	x	---
6	Peterson Feedlot	OU1	1955	---	---	---	---	---	1030560.7	794439.4	---	---	---	x	x	---
7	Timber Products Office	OU1	---	63.8	20.7	---	---	---	1026401.4	797076.8	---	---	6	x	x	---
8	Cartage Building	OU2	1960	---	---	---	---	---			---	---	6	x	x	---
9	Car Wash Well	OU2	1979	>100	20.0	---	---	---	1024733.5	796939.1	---	---	6	x	x	---
10	Hoffman Construction Well	OU2	1980	52.8	12.7	---	---	---	1023663.1	797007.4	---	---	6	x	x	---
11	Log Chipper Well	OU2	1977	47	22.0	---	---	---	1026470.4	795746.1	---	---	6	x	x	---
12	Waste Fuel Boiler Well	OU2	1978	>100	20.5	---	---	---	1024379.0	797430.4	---	---	6	x	x	---
13	Waste Water Clarifier Well	OU3	1970	>100	22.9	---	---	---	1023920.5	795520.3	---	---	6	x	x	---
Proposed Unit 3 Monitoring Well																
1	NFMW22D	OU3	*proposed 2016*	>100	---	---	---	---	1023728.1	792437.6	---	---	---	x	x	x
2	NFMW23D	OU3	*proposed 2016*	>100	---	---	---	---	1026324.3	792017.5	---	---	---	x	x	x
Quality Control Samples																
1	ERB	---	---	---	---	---	---	---	---	---	---	---	---	---	---	x
2	GWD	OU3	---	---	---	---	---	---	1023728.1	792437.6	---	---	---	---	---	x

Notes: --- - not applicable, or data not available
bgs - below ground surface
BTOC - below top of casing
ft amsl - feet above mean sea level
GWD - field duplicate (e.g., blind field replicate)
Loc. - location
NFMW - NewFields Monitoring Well (installed 2014 or 2015)
OU - Operable Unit
SMW - Smurfit Monitoring Well
* - measurement has been completed during a previous investigation
x - measurement will be collected as part of Addendum No. 3.
[1] - Data was acquired from mill records, water rights report (Lotic 2012), and/or well logs and is subject to change based on field verification

TABLE 3

Groundwater Sample Methods, Containers and Preservatives
Addendum No. 3: Deep Groundwater Sampling
Frenchtown Mill Site, Missoula County, Montana

Parameter Group	Analytical Method & Parameters	Number of Containers	Container Type	Preservative / Additive	Hold Time
Field Parameters	**Flow Cell / In Field;** pH, conductivity, DO, ORP, temperature, turbidity	0	---	---	---
Dioxins / Furans	**8290;** congeners PCDD/F (Cl4-Cl8) 2005 WHO	2	1-liter amber glass bottle	Cool to 6°C, sodium thiosulfate	Store at <6°C, or lower, in the dark. Extract within 30 days and analyze within 45 days of extraction. Analyze withing 1 year if sample extracts stored in the dark at < -10oC.
Target Analyte List Metals	**6020;** Ag, Al, As, Ba, Cd, Cr, Co, Cu, Fe, Mn, Ni, Pb, Tl, V, Zn **7471B;** Hg **6010;**Ca, Mg, Na, K	1	250-mL HDPE bottle (Dissolved, Field-Filtered)	Cool to 6°C; nitric acid to pH <2	6 months with the exception of mercury (28 days).
Volatile Organic Compounds (VOCs)	**8260;** See FSP Table D-5	3	40 mL VOA vial	Cool to 6°C; hydrochloric acid to pH<2; Sodium Thiosulfate ($Na_2S_2O_3$) if Cl present	14 days.
Semi-Volatile Organic Compounds (SVOCs)	**8270**; See FSP Table D-5	2	1-liter amber glass bottle	Cool to 6°C	Extract within 7 days after sample collection. Analyze within 40 days of extraction.
Polychlorinated Biphenyls (PCBs)	**8082;** PCBs (Aroclors)	2	1-liter amber glass bottle	Cool to 6°C but above freezing	Extract within 1 year of sample collection. Analyze within 40 days of extraction.
Nutrients	**353.2;** Nitrate+Nitrite **SM 4500-P-E;** Phosphate **SM 5310C;** TOC	1	250-mL HDPE bottle	Cool to 6°C, sulfuric acid to pH <2	28 days
Ions	**300.0;** SO_4, Cl, F **SM2320B;** Alkalinity **SM 2540-C;** TDS **Electrode;** Conductivity, pH	1	500-mL HDPE bottle	Cool to 6°C	All analytes 28 days except TDS (7 days).

Notes:

--- - not applicable
Ag - silver
Al - aluminum
As - arsenic
Ba - barium
Ca - calcium
Cd - cadmium
Cl - chloride
Co - cobalt
Cr - chromium
Cu - copper
°C - degrees celsius
DO - dissolved oxygen
Fe - iron
HDPE - high density polyethylene
Hg - mercury
K - potassium
Mg - magnesium
mL - milliliter
mn - manganese
Na - sodium
Ni - nickel
ORP - oxidation reduction potential
Pb - lead
SO_4 - sulfate
TDS - total dissolved solids
Tl - thallium
TOC - total organic carbon
V - vanadium
Zn - zinc

FSP - NewFields 2015, Field Sampling Plan,
Appendix D of the Remedial Investigation Work Plan, November 2015